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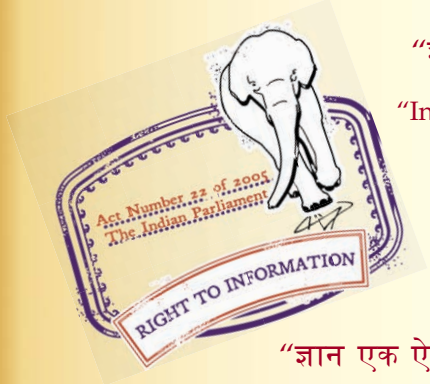

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IS : 10170 - 1982
(Reaffirmed 1995)

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SPECIFICATION FOR BYPRODUCT GYPSUM

(First Reprint SEPTEMBER 1998)

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SPECIFICATION FOR BYPRODUCT GYPSUM

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(*Continued on page* 10)

AMENDMENT NO. 1 MARCH 1996
TO
IS 10170 : 1982 SPECIFICATION FOR BYPRODUCT GYPSUM

(*Page* 3, *clause* **0.3**) — Substitute 'IS 1288 : 1982 Methods of test for mineral gypsum and gypsum products (*second revision*)' *for* 'IS : 1288 - 1973 Methods of test for mineral gypsum and gypsum products'.

(*Page* 3, *clause* **0.4**) — Substitute 'IS 460 (Part 1) : 1985*' *for* 'IS : 460 (Part 1) - 1978*'.

(*Page* 3, *foot-note marked* '*') — Substitute '(*third revision*)' *for* '(*second revision*)' at the end of text.

(*Page* 4, *clause* **2.1**, *line* 3) — Substitute 'IS 1288 : 1982*' *for* 'IS : 1288 - 1973*'.

(*Page* 4, *foot-note marked* '*') — Add '(*second revision*)' at the end of text.

(*Page* 6, *clause* **A-1.1**) — Substitute '(*see* IS 266 : 1993*)' *for* 'See IS : 266 - 1977*'.

(*Page* 6, *foot-note marked* '*') — Substitute '(*third revision*)' *for* '(*second revision*)' at the end of text.

(*Page* 6, *clause* **A-1.8**) — Substitute 'IS 265 : 1993†' *for* 'IS : 265 - 1976†'.

(*Page* 6, *foot-note marked* '†') — Substitute '(*fourth revision*)' *for* '(*second revision*)' at the end of text.

(FAD 27)

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AMENDMENT NO. 2 MAY 2012
TO
IS 10170 : 1982 SPECIFICATION FOR BYPRODUCT GYPSUM

[*Page* 4, *clause* **3.2**(b)] — Substitute 'Quantity of the material in the package,' *for* 'Mass of the material in the package,'.

(FAD 7)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR BYPRODUCT GYPSUM

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 May 1982, after the draft finalized by the Soil Amendments and Reclamation of Problem Soils Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Byproduct gypsum is produced in the country in phosphoric acid plants following wet process technology. This byproduct gypsum like mineral gypsum is also a major soil amendment for reclamation of alkali soils.

0.3 The other Indian Standards on gypsum are:

IS : 1288-1973	Methods of test for mineral gypsum and gypsum products
IS : 1289-1960	Methods for sampling of mineral gypsum
IS : 1290-1973	Specification for mineral gypsum (*second revision*).
IS : 6046-1982	Specification for gypsum for agricultural use (*first revision*).

0.4 For particle size, the use of IS sieves conforming to IS : 460 (Part I)-1978* is prescribed. Where IS sieves are not available, other standard sieves as judged from aperture size may be used.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Specification for test sieves: Part I Wire cloth test sieves (*second revision*).
†Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for byproduct gypsum used as an amendment for alkali soils.

2. REQUIREMENTS

2.1 Fineness — All the material shall pass through 2 mm sieve but 50 percent of it should pass through 0·25 mm (60 mesh) sieve when tested by the method prescribed in **3** of IS : 1288-1973*.

2.2 The material shall also conform to the requirements given in Table 1.

TABLE 1 REQUIREMENT FOR BYPRODUCT GYPSUM

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Appendix of this Standard	Appendix of IS : 6046-1982*
(1)	(2)	(3)	(4)	(5)
i)	Calcium sulphate dihydrate, content, percent, by mass, *Min* on dry basis	70	--	A
ii)	Sodium content as (Na), percent by mass, *Max* on dry basis	0·75	--	B
iii)	Fluorine content, percent by mass, *Max* on dry basis	1·0	A	—
iv)	Free moisture content, percent by mass, *Max*	15	B	—

*Specification for gypsum for agricultural use (*first revision*).

3. PACKING AND MARKING

3.1 Packing — The material shall be supplied in bulk or in package as agreed to between the purchaser and the supplier.

3.2 Marking — When supplied in packages, each package shall be securely closed and marked indelibly with the following information:

a) Name of the material,

b) Mass of the material in the package,

*Methods of test for mineral gypsum and gypsum products (*first revision*).

c) Minimum calcium sulphate dihydrate content,

d) Particle size,

e) Moisture content,

f) Manufacturer's name and recognized trade-mark, and

g) Lot number.

3.2.1 When supplied in bulk, a metallic or card board label of appropriate size, bearing the information required to be given under **3.2** with suitable paint or ink shall conspicuously be displayed on the bulk carrier and also placed inside the consignment.

3.2.2 The product may also be marked with Standard Mark.

3.3 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

4. SAMPLING

4.1 Representative test samples of the material shall be drawn as given in **5** of IS : 1289-1960*.

4.2 Number of Tests

4.2.1 Calcium sulphate dihydrate shall be tested on each of the individual samples.

4.2.2 Tests for remaining characteristics given in **2** of the specification shall be conducted on the composite sample.

4.3 Criteria for Conformity — The lot shall be declared as conforming to the requirements of the specification if **4.3.1** and **4.3.2** are satisfied.

4.3.1 The expression '$\bar{X} - 0{\cdot}6\,R$' is greater than or equal to the minimum limit prescribed in Table 1 of the specification for calcium sulphate dihydrate, where:

$$\text{Mean } (\bar{X}) = \frac{\text{Sum of the test results}}{\text{Number of test results}}$$

*Methods for sampling of mineral gypsum

Range (R) = Difference in the maximum and minimum of the test results.

4.3.2 All the test results on the composite sample meet the relevant requirement given in **2** of the specification.

APPENDIX A

[*Table* 1, *Item* (iii)]

DETERMINATION OF FLUORINE CONTENT

A-0. GENERAL

A-0.1 The determination of fluorine in byproduct gypsum involves decomposition of insoluble fluorine compounds, distillation with concentrated sulphuric acid and separation of fluorine from the distillate by perchloric acid. The flourine in the distillate is determined by spectrophotometric method using Zirconium-Eriochrome Cyanin-R Lake.

A-1. REAGENTS

A-1.1 Sulphuric Acid — *See* IS : 266-1977*.

A-1.2 Sodium Hydroxide — 10 percent and 50 percent solution prepared in double distilled water.

A-1.3 Perchloric Acid — 70 percent.

A-1.4 Silver Perchlorate — 17·5 percent solution prepared in double distilled water.

A-1.5 *p*-Nitrophenol Indicator — 0·5 percent solution prepared in double distilled water.

A-1.6 Eriochrome Cyanin-R — Dissolve 1·80 g of Eriochrome Cyanin-R in double distilled water and dilute to one litre.

A-1.7 Zirconyl Chloride Octahydrate — Dissolve 0·265 g of Zirconyl Chloride in 50 ml double distilled water. Add 700 ml concentrated hydrochloric acid and dilute to one litre with double distilled water.

A-1.8 Concentrated Hydrochloric Acid — *See* IS : 265-1976†.

*Specification for sulphuric acid (*second revision*).
†Specification for hydrochloric acid (*second revision*).

A-1.9 Reference Solution — 5 ml of Eriochrome Cyanin-R (*see* **A-1.6**) is added to 50 ml volumetric flask, 5 ml of solution prepared by diluting 3 ml of concentrated hydrochloric acid (*see* **A-1.8**) to 5 ml with double distilled water is added to the volumetric flask and the volume is made to 50 ml with double distilled water. The solution is used for setting the reference point (100 percent transmittance) of the spectrophotometer.

A-1.10 Standard Fluorine Solution — Dissolve 2·211 g of sodium floride in double distilled water and make the volume to one litre in a volumetric flask. Pipette out 10 ml of this solution into one litre volumetric flask and make up the volume with double distilled water. This solution contains 0·01 mg of fluorine per millilitre.

A-2. APPARATUS

A-2.1 Spectrophotometer

A-2.2 Distillation Apparatus — with three necked distillation flask of 500 ml capacity.

A-2.3 Thermometer — of 0 to 200°C range.

A-2.4 Steam Generator — 2 litre capacity.

A-2.5 Steam Condensation Trap — 60 ml capacity.

A-2.6 Electric Heating Mantle — provided with thermostat and to accommodate 500 ml distillation flask.

A-3. PREPARATION OF SAMPLE

A-3.1 10 grams of air dried byproduct gypsum sample is pulverized in mortar and pestle until the entire sample passes through 200 mesh sieve. The ground sample is oven dried at 100°C to a constant mass.

A-4. PROCEDURE

A-4.1 500 mg of the sample (*see* **A-3.1**) is transferred to the three-necked distillation flask. 50 ml concentrated sulphuric acid and 25 ml double distilled water are added. The distillation flask is placed in an electric heating mantle with thermostat. A thermometer (0 to 200°C) is installed in one of the necks of the distillation flask. The lower 2·5 cm tip of the thermometer is immersed in the concentrated sulphuric acid. The steam distillation head is attached with a 500 ml calibrated beaker placed under the condenser to collect the distillate. The heat is applied slowly to the distillation flask through the heating mantle. When the

temperature reaches 100°C, steam is allowed to enter the flask. The temperature is maintained at 165 ± 2°C throughout the distillation. When approximately 400 ml distillate is collected then 10 ml of 10 percent sodium hydroxide is added to it and evaporated to near dryness on a hot plate. After evaporation of the distillate 25 ml of double distilled water is added to dissolve the salt residues.

A-4.2 The distillate obtained in operation (*see* **A-4.1**) is transferred quantitatively from the beaker to a three necked distillation flask with 50 ml of 70 percent perchloric acid and 25 ml double distilled water. One millilitre of 17·5 percent silver perchlorate solution is added to the flask in order to precipitate the chlorides. The distillation flask is connected to steam distillation head and a 500 ml beaker is placed below the condenser to collect the distillate. One drop of 50 percent sodium hydroxide and two drops of *p*-nitrophenol indicator are added in the beaker to make the distillate alkaline. Heat is applied to the distillation flask through an electric heating mantle to raise the temperature to 132°C. Steam is introduced at this stage and the temperature is raised to 135°C. The temperature is maintained at 135 ± 2°C till approximately 400 ml distillate is collected.

A-4.3 The distillate obtained in operation (*see* **A-4.2**) is quantitatively transferred to a volumetric flask and the volume is made to 500 ml with double distilled water.

A-4.4 Take 5 ml portion of the distillate (*see* **A-4.3**) in 50 ml volumetric flask and add 5 ml double distilled water and mix well. Add one drop of *p*-nitrophenol and then add 4 N hydrochloric acid dropwise till the yellow colour disappears. Add 5 ml of Eriochrome Cyanin-R (*see* **A-1.6**) and 5 ml of Zirconyl Chloride Octahydrate (*see* **A-1.7**) and mix well. Make up the volume to the mark with double distilled water. The colour reaction is immediate and stable, and readings can be recorded immediately or at any other desired time without significant change in transmittance, provided constant temperature is maintained.

A-4.5 Set the spectrophotometer at 527·5 mm (range 525-530 mm) for 100 percent transmittance using the reference solution (*see* **A-1.9**) and record the absorbance/transmittance of the sample solution.

A-4.6 Prepare a standard curve for fluorine using standard fluorine solution (*see* **A-1.10**). Standard fluorine solution may further be diluted with double distilled water and aliquots be selected in the range of 0·00 to 1·40 ppm in terms of fluorine for the preparation of standard curve.

NOTE — A new curve should be prepared for each fresh batch of reagents specified in **A-1.6** and **A-1.7**.

A-4.7 Calculation

A-4.7.1 The fluorine value of the sample aliquot is read from the standard curve (*see* **A-4.6**) and is expressed in percentage taking into account the total dilution factor.

APPENDIX B

[*Table* 1, *Item* (iv)]

DETERMINATION OF FREE MOISTURE CONTENT

B-1. PREPARATION OF SAMPLE

B-1.1 Reduce gross sample to quantity sufficient for analysis or grind approximately 225 g sample without previous sieving. Grind to pass sieve with one mm circular opening. Grind as rapidly as possible to avoid loss or gain of moisture. Mix thoroughly and store in tightly stoppered bottles.

B-2. PROCEDURE

B-2.1 Weigh 2 g of prepared sample (*see* **B-1.1**) into a tared glass weighing dish. Dry sample for two hours $\pm$ 10 minutes at 50 $\pm$ 1·5°C under vacuum of 48-53 cm. Maintain vacuum by passing desiccated air through chamber. Cool in desiccator and reweigh.

B-3. CALCULATION

B-3.1 Free moisture content percent by mass $= \frac{100\,(A - B)}{A}$

where

A = mass, in g, of the sample taken for test; and

B = mass, in g, of the material after drying.

NOTE — Absolute pressure of 23-28 cm, temperature control within specified limits throughout oven chamber is essential. In case facility for required vacuum is not, available, dry the sample for 2 hours $\pm$10 minutes at 70°C in an oven.

(*Continued from page 2*)

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